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**THE
ONTARIO WATER RESOURCES
COMMISSION**

**REPORT ON
WATER POLLUTION SURVEY
OF THE
WELLAND RIVER**

1959 to 1963

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Report on a water pollution
survey of the Welland River :
1959 to 1963 / Decaire, D.

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ONTARIO WATER RESOURCES COMMISSION

REPORT

ON

WATER POLLUTION SURVEY

OF THE

WELLAND RIVER

DATES OF SAMPLING: June 1959
 Feb. 1961
 June 1962
 May 1963
 Sept. 1963

PREPARED BY: D. DECAIRE, c.s.i. (c)

WATER POLLUTION SURVEY
OF THE
WELLAND RIVER AND CHIPPAWA POWER CANAL

INTRODUCTION

Samples were collected on five separate occasions from established sampling points on the Welland River and its main tributaries. The Chippawa Power Canal was not sampled during the September 1963 survey.

The laboratory results of all the surveys are included in the report, together with an explanation of the significance of these tests. For the location of the sampling points, refer to the watershed map enclosed in the envelope at the back of the report.

WELLAND RIVER WATERSHED

The Welland River rises at the eastern limit of the Township of Ancaster in the County of Wentworth. The river is approximately seventy miles long, and it flows into the Chippawa Power Canal which supplies head water to the Sir Adam Beck Generating Station. Niagara River water is diverted westward to the Power Canal via the Welland River, resulting in a flow in this section of the river, opposite in direction to the natural course.

Approximately 250 c.f.s. of Welland Ship Canal water is diverted to the Welland River by the City of Welland Board of Water Commissioners to operate some of the water pumping

facilities. The augmented flow in the Welland River as a result of this diversion also serves to dilute sewage discharges from the City of Welland.

The Welland River is conveyed under the Welland Ship Canal, in Welland. The Welland River watershed is generally comprised of flat terrain, and the river is slow moving during low flow conditions. The river flows through clay lands and the river water usually has a turbid appearance.

DISCUSSION OF SAMPLE RESULTS

In the designation of stream sampling stations, the figures refer to the mileage from the mouth of the main stream.

Sampling points P 2.8, P 3.6, P 4.3, P 5.4, P 7.2 and P 8.8 are from the Chippawa Power Canal. The quality of the water in the Power Canal has been influenced by sewage discharges from the City of Niagara Falls but this municipality has undertaken the construction of treatment works for water pollution control.

Sampling points PWE 11.1, PWE 11.4 and PWE 12.8 are from the Welland River east of the Power Canal. The chlorinated effluent from the Chippawa sewage treatment plant discharges to this branch of the Welland River. A municipal settling tank serving a part of the City of Niagara Falls discharges to the east branch of the Welland River at Stanley Road. The adverse bacteriological results from sample point

PWE 11.1 may be attributed to this municipal settling tank.

There are no known sources of pollution upstream from sampling point PWELT 14.9, on Tee Creek. However, in February 1961 the water contained considerable organic matter as indicated by the B.O.D. analysis and in June 1962 an excessive concentration of coliform organisms was recorded.

The Lyons Creek sampling point numbers are PWEL 12.0, PWEL 13.8, PWEL 14.6, PWEL 16.8, PWEL 19.6, PWEL 23.2 and PWEL 24.2. The stream at sample point PWEL 12.0 has recovered considerably from the pollution load imposed at sampling point PWELB 24.0. Although the Bradley Street pumping station now discharges to Lyons Creek, the City of Welland plans to redirect the sewage to the municipal sewer system which drains to the Welland River.

The industrial wastes which drain to the Lyons Creek contain high concentrations of iron and phenol. The industrial waste discharges emanate from the Page Hersey Tubes Limited and the Welland Tubes Limited. As an objective, the concentration of phenols should not exceed five parts per billion at any point in receiving waters, subsequent to initial dilution. The objective for iron in water is a maximum of 0.3 parts per million.

Sampling stations PWT 9.8 and PWT 10.8 are located, on Thompson's Creek. The pollution of this creek is attributed to the industrial waste discharges from the Cyanamid of Canada Limited (Welland Plant).

The sampling points on the main Welland River west of the Power Canal are PW 9.2, PW 11.7, PW 14.6, PW 17.4, PW 18.6, PW 21.2, PW 27.0, PW 35.2, PW 42.9 and PW 52.2. The effects on the Welland River of sewage discharges from the City of Welland are revealed by the adverse sample results from sampling stations PW 17.4, PW 18.6 and PW 21.2. At sampling station PW 17.4 oily deposits were noted on the shore. Industries which discharge waste water to the Welland River include the Atlas Steel Company Limited, Ford Company Limited (Glass Plant), B.F. Goodrich Canada Limited and the Cyanamid of Canada Limited (Welland Plant).

The City of Welland has announced plans to construct sewage treatment facilities and it is anticipated that this project will soon be undertaken.

Upstream from Welland, some domestic sewage is discharged to the Welland River from the community of Wellandport. The Forks Road Creamery formerly discharged process waste water to the Forks Creek but this company now spray irrigates its waste water.

WATER USES

The City of Niagara Falls obtains water from the east branch of the Welland River, near the Niagara River. The Ford Company Limited (Glass Plant) and the Cyanamid of Canada Limited (Welland Plant) obtain water from the Welland River. The Welland River also provides agricultural requirements for irrigation and cattle watering.

SUMMARY

Municipal sewage and industrial waste discharges have contributed to the pollution of the Welland River. The City of Niagara Falls has already initiated pollution control works and the City of Welland has indicated intentions to proceed in this direction. Further progress in pollution abatement can be achieved by improvements in industrial waste water disposal and by ensuring that satisfactory means of sewage disposal are being practised by the smaller municipalities in the watershed.

RECOMMENDATIONS

1. Action should be taken by responsible municipalities and individuals to eliminate the discharge of untreated waste water to the Welland River and its tributaries.
2. Action is required by industries in the watershed to control their industrial waste discharges, thereby preventing the impairment of stream water quality.

All of which is respectfully submitted,

District Engineer A. B. Redekopp

Approved by K. H. Sharpe, Director

APPENDIX

EXPLANATION & SIGNIFICANCE OF LABORATORY ANALYSES

ALL THE LABORATORY TESTS INCLUDED IN THIS REPORT WERE PERFORMED AT THE ONTARIO WATER RESOURCES COMMISSION LABORATORY IN TORONTO.

A. BACTERIOLOGICAL EXAMINATION

THE MEMBRANE FILTER TECHNIQUE IS USED TO OBTAIN A DIRECT ENUMERATION OF COLIFORM ORGANISMS. THESE ORGANISMS ARE NORMAL INHABITANTS OF THE INTESTINES OF MAN AND OTHER WARM-BLOODED ANIMALS. THEY ARE ALWAYS PRESENT IN LARGE NUMBERS IN SEWAGE AND ARE GENERALLY MINIMAL IN OTHER WATER POLLUTANTS.

THE RESULTS OF THE EXAMINATIONS ARE REPORTED AS "MF COLIFORM COUNT PER 100 ML".

THE COMMISSION'S OBJECTIVE FOR STREAM SANITATION IS A COLIFORM DENSITY OF NOT GREATER THAN 2,400 ORGANISMS PER 100 ML.

B. SANITARY CHEMICAL ANALYSES

BIOCHEMICAL OXYGEN DEMAND (BOD):

BIOCHEMICAL OXYGEN DEMAND IS REPORTED IN PARTS PER MILLION (PPM), AND IS AN INDICATION OF THE AMOUNT OF OXYGEN REQUIRED FOR THE STABILIZATION OF DECOMPOSABLE ORGANIC MATTER IN THE WATER. THE COMPLETION OF THE LABORATORY TEST REQUIRES FIVE DAYS, UNDER THE CONTROLLED INCUBATION TEMPERATURE OF 20°C.

THE COMMISSION OBJECTIVE FOR STREAM WATER QUALITY IS AN UPPER LIMIT OF 4 PPM.

SOLIDS:

THE VALUE FOR TOTAL SOLIDS, EXPRESSED IN PARTS PER MILLION (PPM), IS THE SUM OF THE VALUES FOR THE SUSPENDED AND THE DISSOLVED MATTER IN THE WATER. THE CONCENTRATION OF SUSPENDED SOLIDS IS GENERALLY THE MOST SIGNIFICANT OF THE SOLIDS ANALYSES IN REGARD TO STREAM WATER QUALITY.

THE EFFECTS OF SUSPENDED SOLIDS IN WATER ARE REFLECTED IN DIFFICULTIES ASSOCIATED WITH WATER PURIFICATION, DEPOSITIONS IN STREAMS, AND INJURY TO THE HABITAT OF FISH.

WHERE SUSPENDED SOLIDS VALUES ARE LESS THAN 20 PPM LABORATORY DIFFICULTIES ARE EXPERIENCED AND THE TURBIDITY IS DETERMINED INSTEAD.

TURBIDITY:

TURBIDITY IS CAUSED BY THE PRESENCE OF SUSPENDED MATTER, SUCH AS CLAY, SILT, FINELY DIVIDED ORGANIC MATTER, PLANKTON AND OTHER MICROSCOPIC ORGANISMS IN WATER. IT IS AN EXPRESSION OF THE OPTICAL PROPERTY OF A SAMPLE AND RESULTS ARE REPORTED IN "SILICA UNITS".

WELLAND RIVER SURVEY

DATE	SAMPLING POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	P 2.8	CHIPPAWA POWER CANAL AT WHIRL- POOL ROAD	6.6	186	20	4.0	1,200		
FEB/61			2.3	184	-	2.0	114		
JUNE/62			1.2	214	-	1.5	23,000		
MAY/63			3.1	218	-	5.0	6,000		
JUNE/59	P 3.6	CHIPPAWA POWER CANAL AT STAMFORD CENTRE ROAD	3.6	182	12	6.5	900		
FEB/61			1.5	190	-	1.0	124		
MAY/63			2.7	218		4.5	940		
JUNE/59	P 4.3	CHIPPAWA POWER CANAL AT PORTAGE ROAD BRIDGE	1.1	168	8	6.0	800		
FEB/61			2.7	182		1.0	79		
MAY/63			2.5	214		4.0	1,100		
JUNE/59	P 5.4	CHIPPAWA POWER CANAL AT DOR- CHESTER ST. (TRAFFIC CIRCLE)	6.8	166	20	3.5	700		
FEB/61			2.4	186		1.0	63		
MAY/63			3.0	216		6.0	320		
JUNE/59	P 7.2	CHIPPAWA POWER CANAL AT MCLEOD AVENUE	0.9	172	4	4.3	300		
FEB/61			1.7	190		2.0	47		
MAY/63			2.3	210		9.0	1,150		
JUNE/59	P 8.8	CHIPPAWA POWER CANAL AT JUNCTION WELLAND R. AT M.C.R.	0.8	180	4	3.7	500		
FEB/61			2.5	182		1.0	84		
JUNE/62			1.4	228		1.7	> 15,000		
MAY/63			3.1	196		4.0	980		

DATE	SAMPLING POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F.C. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	PWE 11.1	WELLAND R. (EAST) OPPOSITE GOLF COURSE WEST OF STANLEY RD.	0.9	186	6	8.1	130		
FEB/61			3.8	184		3.0	13,800		
JUNE/62			1.6	240		3.8	24,300		
MAY/63			2.9	196		7.0	42,000		
SEPT/63			2.2	198	11		41,000		
FEB/61	PWE 11.4	WELLAND R. EAST OF STANLEY ROAD	2.6	198		2.0	58		
JUNE/62			0.6	220		1.3	3,800		
MAY/63			2.2	180		6.5	270		
SEPT/63			1.6	186	2		1,300		
JUNE/59	PWEL 12.0	LYONS CREEK JUST ABOVE JUNCTION AT BRIDGE	2.1	204	4	22	150		
FEB/61			2.0	226		3	!		
JUNE/62			1.1	222		1.8	3,000		
MAY/63			2.8	240		11.5	33,000		
SEPT/63			1.0	186	2		1,600	0	0.12
JUNE/59	PWEL 13.8	LYONS CREEK AT CONC. RD. 5 WILLOUGHBY TOWNSHIP	3.8	242	12	24	50		
FEB/61			6.0	408	54		20		
JUNE/62			1.9	312		13.0	150		
MAY/63			2.8	364		27.0	790		
SEPT/63			1.0	280	3			3	0.60
JUNE/59	PWELT 14.9	TEE CREEK AT CONC. RD. 6- WILLOUGHBY TOWNSHIP	3.7	288	18	21	100		
FEB/61			14.0	1178	122		30		
JUNE/62			1.8	332		3.8	4,000		
MAY/63			2.2	226		26	1,170		
SEPT/63			1.7	296	10		120		

DATE	SAMPLING POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	PWEL 14.6	LYONS CREEK AT CONC. RD. 6 WILLOUGHBY TWP.	2.0	274	28	25	20		
FEB/61			16.0	428	58		50		
JUNE/62			1.9	328		2.8	3,000		
MAY/63			2.3	364		24	230		
SEPT/63			1.6	296	7		150	12	0.72
JUNE/59	PWEL 16.8	LYONS CREEK AT TWP. LINE - CROWLAND - WILLOUGHBY	1.3	248	16	15	90		
FEB/61			6.0	452	42		20		
JUNE/62			1.8	374		6.5	1,500		2.25
MAY/63			1.4	366		2.6	310		
SEPT/63			1.3	284	2		410	2	0.36
JUNE/59	PWEL 19.6	LYONS CREEK AT SIDEROAD 1/2 MILE BELOW COOKS MILLS.	1.6	294	4	15	40		
FEB/61			7.6	312		10	750		2.6
JUNE/62			5.6	318	29		9,000		
MAY/63			2.3	318		2.6	90		
SEPT/63			1.9	290	4		460	9	0.9
JUNE/59	PWEL 23.2	LYONS CREEK AT ONTARIO RD.	7.6	342	8	25	190,000		
FEB/61			21.0	398		37	5,000		11.8
JUNE/62			7.0	474	28		247,000	3	4.4
MAY/63			2.8	588		110	16,000,000	8	35.0
SEPT/63			6.0	246	13		> 150,000	20	2.64
SEPT/63	PWEL 24.2	LYONS CREEK AT SOUTH STREET	8.8	350	20		53,000	16	4.5

DATE	SAMPLE POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	PWE 12.1	WELLAND RIVER EAST OPPOSITE SODOM ROAD WEST END OF CHIPPAWA	1.2	214	6	3	500		
FEB/61			1.5	154		3	3		
JUNE/62			1.0	208		1.5	5,100		
MAY/63			2.4	144		5.0	290		
SEPT/63			1.2	190	2		800		
SEPT/63	PWELB 24.0	DITCH DOWNSTREAM FROM BRADLEY ST. 65 PUMPING STATION - WELLAND.		508	119			30	5.5
JUNE/59	PWE 12.8	WELLAND RIVER EAST AT BRIDGE ABOVE MOUTH OF NIAGARA RIVER.	1.5	198	44	7	1,000		
FEB/61			2.8	178		1	45		
JUNE/62			1.1	194		1.3	600		
MAY/63			2.5	136		4.0	200		
SEPT/63			1.2	188	2		3,800		
JUNE/59	PW 9.2	WELLAND RIVER WEST AT CROW- LAND - WILLOUGHBY LINE	2.8	190	4	16	300		
FEB/61			4.2	220		5	5,000		
JUNE/62			2.2	196		1.7	14,100	2.0	
MAY/63			2.6	200		5.5	730		
SEPT/63			1.2	188	2		3,800		
JUNE/59	PWT 9.8	THOMPSON'S CREEK AT PORT ROBINSON RD. JUST ABOVE JUNCTION	1.6	336	50	26	66		
FEB/61			9.0	608	406		30		
JUNE/62			21.0	594	53		239,000		
MAY/63			2.0	1566	300	525	11,000	10	
SEPT/63			19.0	1640	220		< 100,000	0	

DATE	SAMPLE POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	PWT 10.8	THOMPSON'S CREEK JUST BELOW CYANAMID PLANT.	12.0	302	168		20		
JUNE/62			205	824	195		24,000,000		
MAY/63			2.4	2080	300		90	12	18
SEPT/63			28	730	106		2,300	0	
JUNE/59	PW 11.7	WELLAND RIVER WEST OPPOSITE SIDE ROAD 2 3/4 MILES WEST OF POWER CANAL.	2.8	200	10	12	300		
FEB/61			3.7	198		2	500		
JUNE/62			2.8	292	4.5		8,000		
MAY/63			2.0	1242		250	< 10	6	3.0
SEPT/63			4.6	246	27		5,000		
JUNE/59	PW 14.6	WELLAND RIVER WEST AT BRIDGE, PORT ROBINSON JUST EAST OF SHIP CANAL	1.9	196	16	7	400		
FEB/61			3.2	194		2	510		
JUNE/62			1.8	272		34	41,000		
MAY/63			3.7	236		21	80,000		
SEPT/63			2.6	220	30		31,000		
JUNE/59	PW 17.4	WELLAND RIVER NORTH OF DAWNS DRIVE - WELLAND	7.1	262	74	34	3,000		
FEB/61			4.9	182		2	5,800		
JUNE/62			2.8	240		7.0	176,000		
MAY/63			6.0	260		11.0	113,000		
SEPT/63			25	452	220		410,000		
JUNE/59	PW 18.6	WELLAND RIVER WEST AT BRIDGE JUST WEST OF SHIP CANAL.	3.0	216	26	33.0	180,000		
FEB/61			8.0	216		2	97,000		
JUNE/62			1.1	212		27.0	> 1,500,000		
MAY/63			3.8	236		6.5	131,000		
SEPT/63			2.2	230	22		210,000		

DATE	SAMPLING POINT NUMBER	DESCRIPTION	5-DAY B.O.D. (PPM)	TOTAL SOLIDS (PPM)	SUSPENDED SOLIDS (PPM)	TURBIDITY IN SILICA UNITS	M.F.C. COLIFORMS PER 100 ML.	PHENOLS (PPB)	IRON (PPM)
JUNE/59	PWX 19.9	COYLE CREEK AT BRIDGE JUST ABOVE MOUTH.	2.8	308	56		1,000		
FEB/61			10	324		14	60		
JUNE/62			3.2	316	93		25,000		
MAY/63			3.5	320		26	60,000		
SEPT/63			1.6	246	47		100,000		
JUNE/59	✓ PW 21.2	WELLAND RIVER WEST OPPOSITE PELHAM TWP. - WELLAND LINE	14	334	64	87	50,000		
FEB/61			5.6	264		2	7,700		
JUNE/62			2.8	300		45	39,000		
MAY/63			4.4	396		65	37,000		
SEPT/63			2.6	342	54		6,000		
JULY/59	✓ PWF 25.6	FORKS CREEK AT HIGHWAY # 3A	9.2	284	46		100		
FEB/61			5.3	396		3	39		
JUNE/62			2.0	322		43	25,000		
MAY/63			3.2	340		53	360		
JUNE/59	✓ PFW 28.5	WAINFLEET BR. FORKS CR. AT CONC. RD. 4 & 5 - WAINFLEET TWP.	3.6	560	70		10,000		
FEB/61			14.0	798		10	5		
JUNE/62			4.4	436		48	109,000		
MAY/63			3.4	460		59	5,000		
JUNE/59	✓ PWF 28.9	FORKS CREEK AT HWY. # 3A JUST NORTH OF CHAMBERS COR.	5.0	432	70		100		
FEB/61			30	566		34	110		
JUNE/62			2.6	462		48	61,000		
MAY/63			2.8	490		50	150		
SEPT/63			2.6	410	23		100		
JUNE/59	✓ PWFR 32.3	BRANCH FROM WINGER (JUST BELOW) BESIDE HWY. #3	95	4326	72		< 10,000,000		
FEB/61			1,000	4364	196		700		
JUNE/62			3.6	348		9.0	66,000		
MAY/63			3.1	792		8.0	5,000		